COMPENSATORY MITIGATION PLAN

For

MINOR MODIFICATION TO EXISTING NC 12 RIGHT-OF-WAY
Bonner Bridge – Phase I

DARE COUNTY, NORTH CAROLINA

U. S. FISH AND WILDLIFE SERVICE
PEA ISLAND NATIONAL WILDLIFE REFUGE
MANTEO, NORTH CAROLINA

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COMPENSATORY MITIGATION PLAN
MINOR MODIFICATION TO EXISTING RIGHT-OF-WAY

The N. C. Department of Transportation (NCDOT) has requested an amendment to their existing right-of-way (ROW) for NC Highway 12 to construct the new Herbert C. Bonner replacement bridge. The ROW modification is allowable provided that it is defined as minor and for the purpose of providing a safer highway (50 CFR 26.41; 603 FW 2) and mitigation must be provided so as to result in no net loss of habitat quantity and quality on refuge land. The mitigation described herein was prepared by a team of professional wildlife biologists and is intended to be fully compliant with the U. S. Fish and Wildlife Service Compatibility Policy (603 FW 2) and with the guidance of the Service's Mitigation Policy (501 FW 2).

Affected Area

The location for the new bridge and new ROW requested by NCDOT is shown in Figure 1. This alignment proposal presented by NCDOT appears to be impacting 1.150 acres of new ROW based upon the best available estimates. Due to the intensity of development that will occur beyond simply replacing the bridge, the overall area will be highly impacted before, during, and after construction of the new bridge. Compatibility policy requires the Refuge Manager to consider all direct, indirect, and cumulative impacts from past, present, and reasonably foreseeable uses and associated uses when evaluating whether a proposed use is compatible or not (603 FW 2). Compatibility policy further requires that, for an existing right-of-way, modifications must be minor in nature, for the purpose of safety, and there can be no net loss in habitat quantity or quality. Developing the appropriate balance between habitat quantity and quality of those lands impacted versus those lands available for mitigation often requires use of mitigation ratios to meet the "no net loss" standard. This approach is often used in developing wetland mitigation plans. The approach to mitigating the proposed use of refuge land is very similar.

Figure 1.

Habitat Types

Table 1 shows the impacted habitat types in Pea Island National Wildlife Refuge. These habitat types were taken from the Refuge Comprehensive Conservation Plan (2006).

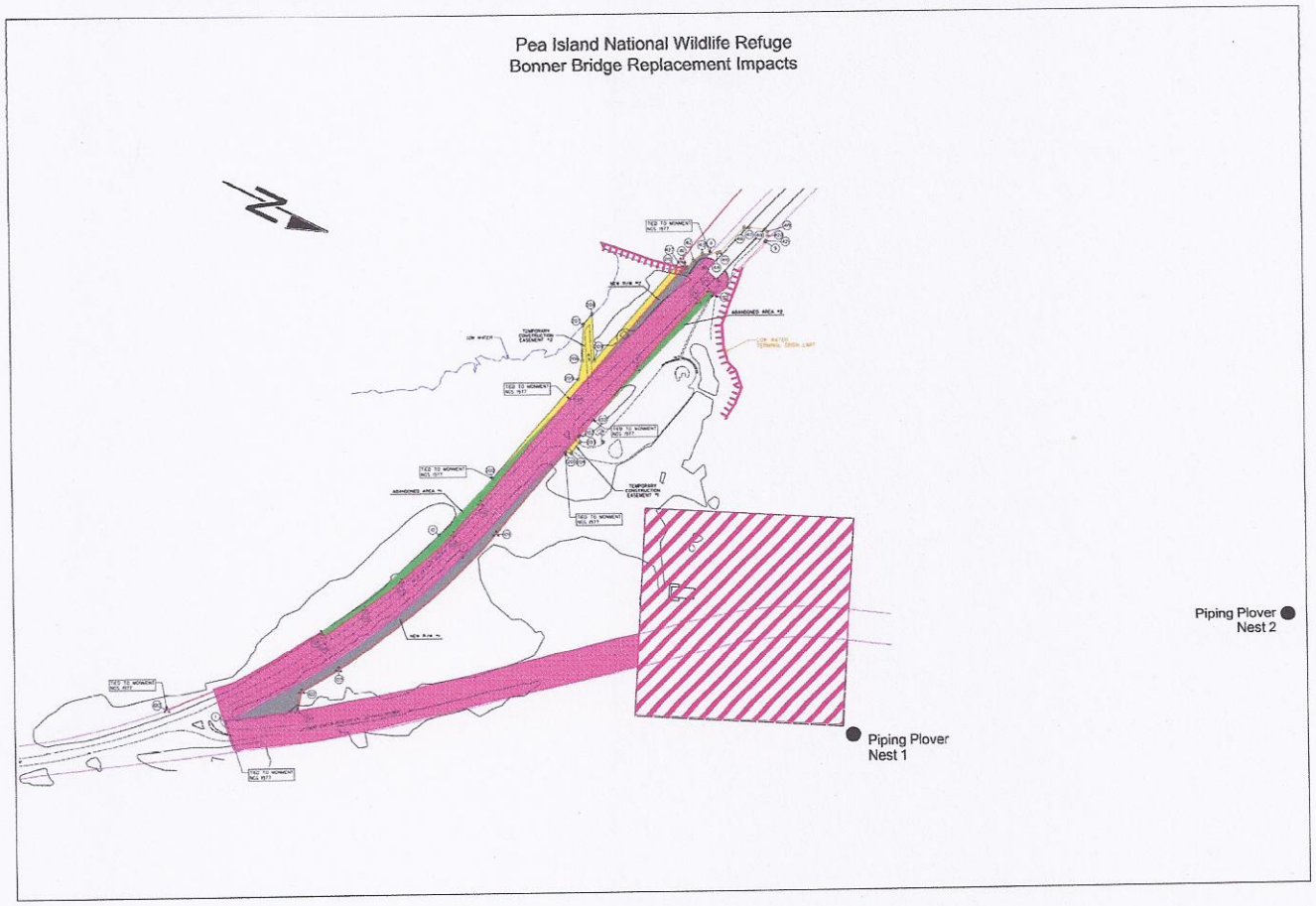
Table 1. Habitat types impacted by the Bonner Bridge (B-2500) replacement project on Pea Island National Wildlife Refuge.

Biotic Community – PINWR - CCP	Biotic Community - NCDOT
Open Water	Open Water
NC 12 Right-of-way, parking lots, paved roads, structures	Upland Man-Dominated
	Wetland Man-Dominated
Maritime Dry Grassland	Upland Maritime Grassland
Maritime Shrub	Upland Maritime Shrub Thicket
	Wetland Maritime Shrub Thicket
Transitional (invasives)	Upland Reed Stand
	Wetland Reed Stand
Marsh (Salt and Brackish)	Wetland Black Needlerush
	Wetland Maritime Grassland

The proposed new ROW alignment for constructing the Phase I Bonner Bridge will have direct impacts on a total of 1.15 acres of refuge land. However, the new ROW acreage estimate does not consider overall impacts accruing from highway construction and maintenance in the vicinity of the project. Table 2 summarizes and presents a more accurate assessment of overall direct, indirect, and cumulative impacts stemming from the bridge replacement project.

This analysis examined the overall area that will be impacted from the proposed use and concluded that there have been and will be additional impacts beyond the 1.15 acres of refuge land to be included in new ROW. As shown in Figure 2, this includes the existing ROW for NC 12 and the Old Coast Guard Station Road ROW. With the exception of the driveway connection to the currently existing parking lot, those areas under a temporary construction easement will also realize a degradation of habitat value and will take considerable time to recover. These areas often never recover to pre-project habitat values. All of these areas will be used and maintained during and after construction of the Phase I bridge. These areas have been or will be affected through direct, indirect, or cumulative impacts and must be considered for compliance with policy requirements for no net loss in quantity or quality of refuge habitat.

Figure 2. Total affected area on Pea Island National Wildlife Refuge from direct, indirect, and cumulative impacts from the Bonner Bridge (B-2500) replacement project.



Areas included in this analysis were based upon a right-of-way action, either past or pending, wherein the use of Refuge lands was not mitigated. The area labeled "Refuge Parking Lot" was not included in the analysis as it represents a joint effort between the National Park Service and the Fish & Wildlife Service wherein no right-of-way permit was involved. The 10-acre inholding known as the Old Coast Guard Station was not included in the analysis as this property was established and in use before the Refuge was established.

The Old Coast Guard Station Road ROW, originally NC 12, extended from the current intersection to a ferry terminal at Oregon Inlet and was established in the 1950's through the 10-acre inholding. No impact analysis or mitigation was done at the time. The Coast Guard Station was decommissioned in the late1980's and the road has not been maintained since that time. The segment of road ROW south of the Old Coast Guard Station has been used opportunistically by the public for access to the beach and NCDOT and the U.S. Army Corps of Engineers as a staging area for bridge, NC 12, and navigation channel maintenance. These activities on this unmaintained road ROW create fragmentation and disturbance impacts to the Refuge. The State of North Carolina has proposed repurposing, and opening to the public, the Old Coast Guard Station. Consequently, NCDOT has consistently stated that they must maintain access to the Old Coast Guard Station property and, therefore, for the purpose of this analysis, this road ROW represents indirect and cumulative impacts which are accounted for in Table 2. The remainder of the Old Coast Guard Station Road ROW north of the inholding to a ferry terminal pre-dating the bridge was not included in the analysis as it is presumed to be abandoned and reverted back to the Refuge.

As a temporary emergency measure, a ferry access road on the southwest side of NC 12 was constructed in 1990 by NCDOT under Service emergency authorization provisions with a Special Use Permit from the Refuge Manager because a section of the bridge was knocked out by a dredge vessel. Required post-emergency environmental compliance was not done and this temporary emergency road has remained in place for 20+ years. The road falls within the proposed "New ROW", but NCDOT has not described what the future plan is for this road. Although impacts to Refuge land occurred, the area affected by this temporary road was not included in this analysis as the road was to be temporary and there was no formally designated right-of-way. NCDOT needs to describe their plan for this road so the Service can evaluate impacts since the long neglected impact analysis has not been done and the road remains.

Refuge acreage impacted by the Terminal Groin was not included in this analysis. Use relative to the Terminal Groin was evaluated and authorized under a separate Service Permit.

Finally, permits or easements for the remainder of NC Highway 12 beyond the project area were not included in this analysis as it is presumed these issues will be addressed at some point in the future as the NC 12 Transportation Management Plan develops and is implemented. The approach taken for developing this mitigation plan represents a reasonable approach to mitigation actions that can be taken without imposing undue burden on NCDOT and maintaining full compliance with Service policy.

Table 2. Direct, indirect, and cumulative impacts associated with the right-of-way modification for the Bonner Bridge replacement project, Pea Island National Wildlife Refuge, Dare County, North Carolina. References to colors in individual table cells are intended to aid location of the area on the map depicted in Figure 2.

Right-of-Way Description	Direct	Indirect/Cumulative	Impacted Habitat	Returned ROW	Returned ROW Value Equivalent Credit	Net Impact
New ROW	1.15 (Gray)	Fragmentation, Lower Species Diversity, Disturbance	1.15			1.15
Existing NC12 ROW	Fragmentation, Lower Species Diversity, Disturbance	6.66* (Pink & Green)	6.66	0.654 (Green)	0.065** (10%)	6.595
Temporary Construction Easement	Recovery Time Habitat Quality Loss, Disturbance	0.457 (Yellow)	0.457	0.457	0.229** (50%)	0.228
Old Coast Guard Station Road	Fragmentation, Lower Species Diversity, Disturbance	2.23*** (Pink)	2.23			2.23
TOTAL	1.15	9.347	10.497	1.111	0.294	10.203

*Based upon final acreage determinations from NCDOT.
**These areas will not return to the same value of un-impacted migratory bird habitat during the project life due to the degree and nature of disturbance and proximity to ongoing vehicular and pedestrian traffic
***This current sand trail road will be reconstructed and repaved to access a paved staging area on the 10-acre inholding. Mitigation was never provided for the original right-of-way. There will be direct, indirect, and cumulative refuge habitat impacts associated with this component of the bridge replacement plan requiring mitigation. The reference to colors is relative to the colors shown in Figure 2. The pink, cross-hatched area on the attached figure is the 10-acre inholding which will be used as a staging area during construction. Use of this area will result in indirect impacts on refuge habitat and wildlife but have not been accounted for in this Mitigation Plan.

The project as currently proposed will have a net adverse impact on approximately 10.203 acres of refuge lands based upon the analysis of direct and indirect effects (Table 2). This is a conservative estimate of the overall impacts of the project since it does not fully evaluate the effects of noise, increases in human disturbance, or introduction of exotic or invasive species into the area. Likewise, the analysis does not fully evaluate cumulative impacts from all uses.

The team recognizes that NCDOT is proposing to allow 0.654 acre of present ROW to revert back to the refuge through provisions for abandonment. However, it is not possible to complete an instantaneous restoration of the abandoned roadbed to the same quality of undisturbed habitat. Even if it were possible to restore primary productivity, the value of that habitat would be diminished due to the ongoing and increasing disturbance that will occur in the area due its close proximity to the project.

The Returned Value Equivalent for the returned ROW is low and deserves explanation. This value is based on the assumption that nothing is done beyond declaring the ROW to be abandoned and that NCDOT relinquishes all rights and reservations to those lands. Actions can be taken to increase the wildlife habitat value of this returned ROW. These actions include:

1. Remove all pavement, rocks, gravel, and other materials that would not normally be found in barrier island overwash sand deposits. This would include plowing and tilling the old roadbed to a depth sufficient for breaking up any hard pan that may have formed.

2. Restore natural elevations and contours relevant to adjacent marsh. This restoration would include restoration of some form of "topsoil" similar to that of adjacent marsh.

3. Plant native marsh species and monitor for survival, growth, and reproduction. Replant as necessary to establish primary productivity similar to adjacent or nearby coastal marsh. Monitor and remove or treat any exotic/invasive plant establishment within returned right-of-way

4. Restrict pedestrian access through the restored area.

Upon completion of cleanup, grading, and planting of the 0.654 acre, it is conceivable that the Returned Value Equivalent could increase some but it will not have an instantaneous value of 0.654 acre due to the time lag for full restoration of natural processes and productivity (primary and secondary) and also due to proximity to areas of high human disturbance. This rationale is consistent with standard mitigation practices employed during the evaluation of environmental impacts of a project proposal.

Wildlife/Habitat Associations

Wildlife species using the project site vary with seasons and the degree of human disturbance. The greatest numbers of individuals and the highest level of species diversity generally occur during spring migration for migratory birds. In addition, the project area is designated as critical wintering habitat for the federally listed piping plover. Also, wintering waterfowl may be seen in the nearshore waters. Following is a more detailed description of the affected priority habitats and priority plant and animal species described in the approved Pea Island National Wildlife Refuge Comprehensive Conservation Plan (PINWR CCP) (2006) and recognized species lists of management and conservation concern (U.S. Fish and Wildlife Service 2008, North Carolina Natural Heritage Data). Species included in this Mitigation Plan are known to occur on or nearby the project site during some part of the year.

Open Water (Pamlico Sound)

Open Water habitat has been excluded from the mitigation analysis as it is not technically part of the refuge land base, however the habitat type does fall within the area defined by the Refuge's Proclamation Boundary in Pamlico Sound. The approximate 25,000 acre area in the Sound was established as an inviolate sanctuary for migratory birds. Within this Proclamation Boundary the

Refuge's authority is extended to protect migratory birds from harm or harassment. Birds of Management Concern for this habitat type include but are not limited to:

American black duck***
Gadwall***
Mallard***
American wigeon***
Blue-winged teal***
Green-winged teal***
Ruddy duck***
Ring-necked duck***
Northern pintail***
Common tern***
Gull-billed tern***

Inter-tidal Mud Flat

Another habitat type that will be impacted by the project and not described in Table 1 is Inter-tidal Mud Flat. This habitat is a zone between mean high tide and mean low tide and it provides important foraging habitat for a wide range of shorebirds as well as marsh and wading birds. Several species of plovers and sandpipers as well as dunlin, yellowlegs, white ibis, glossy ibis, egrets, and herons are frequently seen using the area during periods of low human disturbance. Birds that are federally listed and/or listed of Management and Conservation Concern for this habitat type include but are not limited to:

Piping plover* (within the area designated as critical winter habitat for piping plovers)
American black duck***
Gadwall***
Semi-palmated Sandpiper**** (Semi-palmated sandpipers have experienced dramatic declines in the region.)
Short-billed Dowitcher****
Solitary Sandpiper****

Marsh

Marsh habitat within the project area can be viewed as coastal marsh which includes salt marsh and brackish marsh for the purposes of this analysis. Dominant plant species in this habitat type varies from black needlerush (*Juncus roemerianus*) interspersed with saltmeadow grass (*Spartina patens*) and salt grass (*Distichlis spicata*) in the brackish marsh to smooth cordgrass (*Spartina alterniflora*) with some black needlerush, saltmeadow grass, and salt grass mixed in with bald spikerush (*Fimbristylis spadicea*), saltwort (*Salicornia virginica*), and rose mallow (*Hibiscus moscheutus*) occurring in the salt marsh. Birds that are federally listed and/or listed of Management and Conservation Concern for this habitat type include but are not limited to:

Salt marsh sharp-tailed sparrow**
Seaside sparrow**
Black rail**
Yellow rail**
King rail**
Sedge wren**
American Bittern****

Seaside and salt marsh sharp-tailed sparrows are found only in coastal salt marshes of eastern North America.

Maritime Shrub

The maritime shrub habitat type can be found under a wide range of conditions ranging from excessively drained to poorly drained soil types. It does not grow in areas that are not protected from salt spray or flooding by salt water. Plant species present can be highly variable due to successional stage and landscape position. Dominant shrub/vine species include wax myrtle (*Myrica cerifera*), red cedar (*Juniperus virginiana*), Southern red cedar (*Juniperus silicicola*), saltmeadow bush (*Baccharis halimifolia*), greenbrier (*Smilax spp*), and poison ivy (*Toxicodendron radicans*). A wide range of wildlife species may be using this habitat type, including mammals such as the raccoon and white-tailed deer to passerine birds. Under some circumstances colonial nesting birds use the shrub habitat for nesting. Birds that are federally listed and/or listed of Management and Conservation Concern for this habitat type include but are not limited to:

Prairie warbler**
Northern parula**
Yellow-throated warbler**
Black-throated Green Warbler****

Other bird species known to use or inhabit this habitat type are:

Carolina wren, Ruby-crowned kinglet, American robin, Gray catbird, Northern mockingbird, Cedar waxwing, Yellow-rumped warbler, Eastern towhee, Song sparrow, White-crowned sparrow, Eastern meadowlark, Red-winged blackbird, Common grackle, American goldfinch

Raptors can often be seen perching in the shrubs of this habitat type.

Maritime Dry Grassland

The NCDOT habitat type classification included Wetland Maritime Grassland and Upland Maritime Grassland. For the purposes of this analysis and based upon plant species present, the Service considered Wetland Maritime Grassland under marsh. The Upland Maritime Grassland fits into the PINWR CCP category of Maritime Dry Grassland. This plant community can occur on low, stable dunes, sand ridges, or other elevated sites such as overwash terraces. The dominant plant species is saltmeadow grass but other species such as seaside goldenrod (*Solidago sempervirens*), marsh pink (*Sabatia stellaris*), gaillardia (*Gaillardia pulchella*), and seaside greenbrier (*Smilax auriculata*) may be present. Birds that are federally-listed and/or listed of Management and Conservation Concern for this habitat type include but are not limited to:

Salt marsh sharp-tailed sparrow**
Seaside sparrow**
Sedge wren**

Other bird species known to use or inhabit this habitat type are:

Nelson's sharp-tailed sparrow, Savannah sparrow, Marsh wren, Willet (nesting), and Northern harrier.

NOTE:

*Federally listed, ** Federal Species of Concern, *** Species of Management Concern on Pea Island NWR, ****Bird of Conservation Concern.

USFWS Mitigation Policy

Policy requires that mitigation sufficient to prevent the loss of refuge habitat quantity or quality be provided and in place when amending an existing ROW (603 FW 2.11D). Guidance for developing appropriate and adequate mitigation is provided in the Service's Mitigation Policy (501 FW 2). The first steps in development of the project's Mitigation Plan are to avoid impacts to the maximum extent possible and then to minimize the unavoidable impacts. After these initial steps, the next steps are to determine the Resource Category of the affected habitat based upon uniqueness and habitat quality

and then develop appropriate measures to offset the project impacts. The Resource Categories are presented and briefly discussed below:

A. Resource Category 1. The designation criteria for habitat in Resource Category 1 is "habitat to be impacted is of high value for evaluation species and is unique and irreplaceable on a national basis or in the ecoregion section." The mitigation goal for habitat in Resource Category 1 is "no loss of existing habitat value."

B. Resource Category 2. The designation criteria for habitat in Resource Category 2 is "habitat to be impacted is of high quality for evaluation species and is relatively scarce or becoming scarce on a national basis or in the ecoregion section." The mitigation goal for habitat in Resource Category 2 is "no net loss of in-kind habitat value."

C. Resource Category 3. The designation criteria for Resource Category 3 is "habitat to be impacted is of high to medium value for evaluation species." The mitigation goal for habitat in Resource Category 3 is "no net loss of habitat value while minimizing loss of in-kind habitat value."

D. Resource Category 4. The designation criteria for Resource Category 4 is "habitat to be impacted is of medium to low value for evaluation species." The mitigation goal for habitat in Resource Category 4 is "minimize loss of habitat value."

Policy requires that all Resource Category determinations are to be fully supported by adequate technical rationale, demonstrate good professional judgment, and be consistent with other determinations. With this policy guidance a team of three professional wildlife biologists with knowledge of the affected refuge habitat types and the associated wildlife species using these habitat types was formed to prepare this mitigation plan for the Refuge Manager.

Initially the team debated over whether or not the affected habitats should be considered a Resource Category 1. After some discussion, the team agreed that the specific habitat value of these important and disappearing habitat types has been somewhat affected by the existing road and other human activities that have occurred in this area. An agreement was reached that the affected habitat could be designated as a Resource Category 2, but impacts to the habitat have not been sufficient to warrant a lower designation. The mitigation goal for habitat in Resource Category 2 is "no net loss of in-kind habitat value.

Mitigation Policy outlines types of actions that can be incorporated into mitigation recommendations. For Resource Category 2 habitat the Service will recommend ways to avoid or minimize losses. If losses are likely to occur, then the Service will recommend that those losses be compensated by replacement of the same kind of habitat value so that the total loss of such in-kind habitat value will be eliminated. Unlike a Resource Category 1 designation, there is some flexibility with in-kind vs out-of-kind mitigation for Resource Category 2 habitat {FR 46(15)(V)(B) pp7657-7658}.

The location of potential mitigation lands is crucial to achieving the required no net loss of habitat quantity or quality. The highest priority will be given to the recommendation of a mitigation site within the immediate vicinity of the project area such as an in-holding. Second priority will be given to the recommendation of a mitigation site adjacent to or in reasonably close proximity to the project area and the lowest priority would be given to a mitigation site

removed from the project area. (Note: The Dare County Land Use Plan does not support offsite mitigation).

Mitigation Requirements for Resource Category 2 Habitat

When discussing appropriate strategies for mitigating the loss of Resource Category 2 habitat, the team evaluated several scenarios. This approach was somewhat limited due to land availability and habitat types currently on the land that may become available for mitigation. In terms of mitigation ratios, for replacement of in-kind habitat value, a 2:1 compensation to impact ratio is generally an acceptable starting point. This ratio is commonly applied in regulatory proceedings and considers factors such as uncertainty in the ability to achieve desired conditions through restoration and the time it takes restored habitat to achieve full function. This ratio could be adjusted based on a more detailed analysis of the effects of the project and the value of the proposed mitigation on the evaluation species. The team believes that less than a 2:1 ratio such as a 1:1 ratio would be possible for land considered as an in-holding with in-kind habitat. A 1:1 replacement ratio would depend upon the quality of available habitat in the in-holding. Table 3 summarizes mitigation possibilities, mitigation ratios and the acreage that would be necessary to achieve the requirement of no loss in habitat quantity or quality. Total mitigation acreage is based upon direct and indirect impacts affecting 10.203 acres of refuge land.

Table 3. Mitigation requirements to ensure "no net loss in habitat quantity or quality" compliance with USFWS regulations for impacted habitat at Pea Island National Wildlife Refuge, Dare County, North Carolina.

Habitat location & description	Mitigation Ratio	Total Acres Required
In-holding & In-kind	1:1	10.203
In-holding & Out-of-kind	2:1	20.406
Adjacent (joins refuge boundary) & In-kind	2.5:1	25.508
Adjacent (not joining refuge boundary but in vicinity) & In-kind	3:1	30.609
Adjacent (joins refuge boundary) & Out-of-kind	4:1	40.812
Adjacent (not joining refuge boundary but in vicinity) & Out-of-kind	5:1	51.015

The team did not consider two additional possibilities due to inconsistencies with the Dare County Land Use Plan (CAMA; CZMA). They included "Off site and In-Kind" and "Off site and Out-of-Kind" mitigation. Although more conservative, these refuge habitat mitigation ratios were developed to parallel procedures used for wetland mitigation ratios.

Mitigation ratios reflect the best professional judgment of the team of professional wildlife biologists based on quantity, quality, and wildlife use of the impacted habitat compared to habitat that may be available for mitigation purposes. It is clear that as the location of a potential site to refuge land becomes further removed from the refuge land impact site, and as quality relative to existing quality at the potential mitigation site decreases, quantity must increase to arrive at a state of no net loss of refuge habitat as required by policy and regulation. The team also accepted that, under certain circumstances, it may be necessary to offset the loss or degradation of foraging habitat with habitat that would satisfy another life requisite for some species such as nesting habitat.

Factors affecting the selection of a mitigation site including but not limited to costs of land acquisition and restoration, or the availability of willing sellers are important but beyond the scope of this discussion. Here we are addressing Service decisions regarding the appropriate type and amount of compensatory mitigation, which is guided by the Service's Mitigation Policy.

Because the impacts will be occurring on Refuge lands, one of the first criteria should be that the mitigation should be provided on or adjacent to Refuge. Through this approach, the options for potential mitigation sites are immediately narrowed to two areas: the Old Coast Guard Station 10-acre in-holding at the north end of the refuge, and private lands adjacent to the Refuge's southern boundary in Rodanthe. When considering these two sites in light of the Mitigation Policy, we must first consider the mitigation goal for Resource Category 2 habitat which is no net loss of in-kind habitat value. In terms of the two potential mitigation sites, it is important to note that one (Rodanthe private lands) has the potential to provide adjacent and in-kind sound-side habitat, whereas the other (10-acre in-holding) would provide out-of-kind ocean-side dune and inter-dune swale habitat.

There are other considerations affecting the functionality of these sites that must be documented. Assuming the potential mitigation site in Rodanthe involved adding land to the Refuge's southern boundary, the restored habitat would then be adjacent to developed private property to its south. That would have a negative effect on the value of the restored habitat to wildlife. This may be at least partially offset by the fact that the habitat at the existing refuge boundary would be buffered by the new habitat; thereby increasing its value. The magnitude of these effects depends on the sensitivity of the evaluation species to edge effects, the configuration and design of the mitigation site, and the type and intensity of adjacent lands uses. As part of the analysis of the Rodanthe site or sites the condition of adjacent Refuge and private lands will need to be characterized.

The 10-acre in-holding also has landscape considerations. Its proximity to the impacted area adds to its value. Additionally, if the entire 10 acres were restored and added to the Refuge, there would be no issues with non-complimentary adjacent uses or edge effect that would compromise the value of the restored habitat. On the other hand, if only a portion of the site were restored and a developed in-holding remained, the effects of this remaining adjacent development would certainly have a negative effect on the value of the restored site to the evaluation species, which would need to be documented and evaluated. Indeed, given the out-of-kind nature of the habitat, it appears possible that any degradation of the sites value due to non-complimentary adjacent development could render the site unsuitable as a mitigation site. If less than full restoration of the 10-acre in-holding is contemplated, the effects of any remaining development must be carefully evaluated.

In the case of the 10-acre in-holding site, out-of-kind compensation for loss of Resource Category 2 habitat is generally not preferred, unless the replacement habitat is of greater value than the type lost, or opportunities for in-kind replacement are not available. There are very real issues regarding the potential to add lands to the southern boundary of the Refuge. Analysis of sites constraints such as costs and availability of willing sellers would be the responsibility of NCDOT, and these constraints may render the Rodanthe site unviable. In terms of biological considerations, replacement of the wetlands at the impact site with overwash terrace, dune, and dune swale habitat, which may support nesting by some species if properly managed lends support to acceptance of out-of-kind habitat replacement. At any rate, acceptance of out-of-kind compensation generally entails higher or no less than the above-mentioned 2:1 ratio, and the additional landscape context factors mentioned above regarding the 10-acre site may reduce the analysis of this site to an all-or-nothing decision.

Mitigation Plan Components

The team of professional wildlife biologists preparing this Mitigation Plan focused on the quantity and quality of habitat impacted by bridge construction project. While habitat values and priority wildlife species are important and were the fundamental drivers for this plan, the team also recognized a very limited universe of potential mitigation sites within or adjacent to refuge boundaries. Moving away from refuge land to identify non-adjacent but nearby refuge land is problematic on many fronts and would generally be considered as not acceptable. Consequently, the team recommends the following mitigation plan components:

1. Old Coast Guard Station In-holding (10 acres)

a. The 10-acre parcel known as the Old Coast Guard Station property shall be transferred in entirety to the U. S. Fish & Wildlife Service to be added to Pea Island National Wildlife Refuge. The State of North Carolina and the County of Dare shall relinquish any and all rights, reservations, or any other encumbrances associated with said property.
b. The historic building known as the Old Coast Guard Station may either remain in place or be removed from the property to an off-refuge site.
    1. If the building remains in place NCDOT or the State of North Carolina shall be responsible for maintenance at intervals sufficient to preserve and protect the historic properties of the building.
    2. To allow viewing of the cultural resource, NCDOT shall design and construct a boardwalk and observation deck from the northeastern corner of the existing parking lot adjacent to NC 12. Final alignment and design of the boardwalk and observation deck shall be subject to the approval of the Refuge Manager.
c. All other buildings, pavement, concrete, water lines septic tanks/lines, fuel tanks/lines or any hazardous materials, and debris shall be removed from the entire 10-acre parcel to the satisfaction of the Refuge Manager prior to transferring the property.

Justification: The in-kind habitat is a priority habitat for the refuge and a declining habitat in the region, therefore, 2:1 compensation ratio is required. In addition, the priority species identified for the affected habitat types have a high sensitivity for the in-kind plant species and growth form characteristics that need to be present at the mitigation site(s). While the 10-acre in-holding habitat is out-of-kind and creation of in-kind habitat would require continuous maintenance, replacement with nesting habitat for some species renders the ratio marginally acceptable. Replacing impacted habitat with a combination of in-kind and other priority habitat within the boundary or adjacent to the refuge is allowable with Resource Category 2 habitat.

2. Old Coast Guard Station Road Right-of-Way
    a. The Old Coast Guard Station Road Right-of-Way shall be declared abandoned allowing the underlying estate to revert back to refuge land. The State of North Carolina and the County of Dare shall relinquish any and all rights, reservations, or any other encumbrances associated with said property.
    b. All asphalt and any associated materials related to highway construction, operation, and maintenance shall be removed from the abandoned right-of-way.
    c. The Refuge will work with the N. C. Department of Transportation for future access to manage habitat in the fillet adjacent to the Terminal Groin.

Justification: See the discussion under #1. Replacing impacted habitat with a combination of in-kind and other priority habitat within the boundary or adjacent to the refuge is allowable with Resource Category 2 habitat. This action will add 2.23 acres to the 10 acre in-holding.

3. Monitoring and Modeling
    a. NCDOT shall provide funding for the development of model(s) described by the USFWS designed to provide the required inputs and outputs for answering "if-then" statements that would predict the kinds of changes (in area, arrangement, location, quality) to Refuge habitat and the vulnerability of NC 12 from coastal processes such as overwash events (storm effects), erosion (shoreline regression, dune/berm changes, elevation changes), sea level rise, road location, berm location and size. Results from this modeling would facilitate decision making with regards to NCDOT maintenance activities and refuge management actions

Justification: Results from modeling future conditions would be used through a cooperative planning effort to find the best solution for maintaining NC-12 as well as avoid and minimize impacts to Refuge resources.

4. Bridge Guard Rail Modifications
   Bird/vehicle strikes on area bridges have resulted in substantial mortality in resident and migratory birds. It has been documented that traffic driving across these bridges has resulted in the death of 25-30 birds over a 2-3 day timeframe. This daily bird mortality can go even higher with species that tend to occur in large flocks near special features such as roost sites. Special measures are required to reduce this type of mortality. Lowering speed limits and increasing awareness have reduced but not eliminated mortality for purple martins at the Old Manns Harbor Bridge in Dare County, North Carolina. Chain link fencing 6 feet high mounted on top of the bridge guard rail was used in Texas to essentially eliminate purple martin mortality. Metal poles 9.3 feet long and spaced about 3 feet apart along the bridge railing reduced bird mortality by at least 64%.

   As the U. S. Fish and Wildlife Service is responsible for the protection and conservation of migratory birds and the Refuge is responsible for protecting birds (Migratory Bird Treaty Act {MBTA: 16 USC § 703 et seq.}) from harm or harassment within the Pea Island National Wildlife Refuge Proclamation Boundary the following shall be implemented:
   a. Commencing upon entry into the Pea Island National Wildlife Refuge Proclamation Boundary area, the Phase I Parallel Bridge guard rail design shall incorporate structural elements to force birds up and above traffic, including large trucks, when crossing over the bridge. These structural elements must be designed to the satisfaction of the Refuge Manager and shall extend along both sides of the bridge from the northern crossing of the Proclamation Boundary to the southern terminus of the bridge on the refuge.
   b. The NCDOT shall establish a monitoring program wherein statistically valid data regarding bird mortality on area bridges is documented on a continuous basis and the effects of mitigating structures are measured for comparison to baseline conditions.

Justification: Special design features have proven to be effective in reducing bird/vehicle strike mortality. Incorporating these features will reduce bird mortality on the replacement Bonner Bridge. These features will also create a safer highway for humans.

5. Exotic/Invasives Control
   With the introduction of offsite construction materials and through ground disturbances, the potential for exotic and invasive species introduction increases. Consequently, NCDOT shall:
   a. Incorporate monitoring for the introduction of invasive and/or exotic species to the refuge as a result of highway construction, operation, and maintenance within any and all easement areas wherein NCDOT or the State of North Carolina is identified as the holder of the easement.
   b. Upon discovery of an exotic or invasive species by refuge staff or NCDOT within the ROW, NCDOT shall notify the Refuge and initiate control measures upon Refuge approval.

Justification: Exotic and invasive species introductions and proliferation are known to occur along transportation corridors. These undesirable species can affect the quality of habitat and wildlife populations over a relatively short period of time. It is imperative that introductions be eliminated or minimized and stopping the spread of those species that are introduced.

It is acknowledged that this plan will not result in a direct 2:1 replacement of habitat. It will replace 10 acres and will restore 2.23 acres of unencumbered habitat to the refuge for a total of approximately 12.23 acres. Development of a prudent mitigation plan involves the integration of habitat quantity and habitat quality. Little can be done with regards to habitat quantity as all available inholding or adjacent habitat is used through the 12.23 acres. Qualitatively, there is value in the 12.23 acres becoming part of the refuge and managed for migratory bird habitat. Changes in the impact area resulting in a reduction in habitat fragmentation, decreased disturbance from human activity and through management actions by the refuge habitat improvement enhances the value of the 12.23 acres. Assuming that all parties agree this qualitative change could be equated to the 8.23 acres remaining to be mitigated to satisfy the policy driven mitigation requirements.

The alternative to integrating quantitative measures with the qualitative components would be to find additional acreage of suitable habitat. Of the total 20.406 acres required for a 2:1 replacement ratio, the remaining 8.23 acres could be mitigated through addition of other land with in-kind habitat on the south end of Pea Island National Wildlife Refuge or possibly, through creation of new wetland habitat on the Sound side of the Refuge. Either approach would require application of the appropriate mitigation ratio. The monitoring and modeling will enable informed decisions prior to future events that will inevitably require significant management actions in and along the transportation facility corridor. Guard rail modifications are used elsewhere in the United States and are known to reduce mortality in migratory birds. Colonization by exotic or invasive species can affect habitat quality over wide areas and some can introduce disease. This mitigation plan represents a sincere effort to allow a transportation project with no net loss in quantity or quality of refuge wildlife habitat. Also, this mitigation plan, if fully implemented, will allow the Refuge Manager to conclude that the use neither materially interferes with nor does it detract from the mission of the National Wildlife Refuge System and the purpose for which Pea Island National Wildlife Refuge was established.

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